



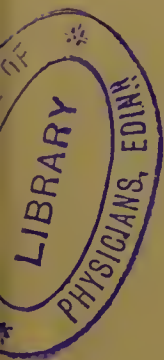
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AN  
OUTBREAK OF CEREBRO-SPINAL  
FEVER.

BY

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## AN OUTBREAK OF CEREBRO-SPINAL FEVER.

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OUTBREAKS of cerebro-spinal fever are so rare in this country that no apology need be offered for publishing the following account of one which came under my notice. It occurred in Dundee in the winter of 1877-78. I was then physician to the hospital of that town, and the cases whose details are given were all under my own care, while the facts and incidents of the outbreak were investigated by myself at the time of their occurrence. Though typhus and typhoid fevers occupy a prominent place in the records of the Dundee Infirmary, cerebro-spinal fever finds no place in them up to the date of the events which I am about to relate. Thirty-four cases were treated in the Hospital. To give details of all would occupy too much space. I content myself, therefore, with giving only a few to illustrate the leading features of the whole.

At 5 Tannadice Street resided P. C., his wife, and seven children. Early in November 1877 P. C. was seized with an illness which was said to be typhus fever, for which he was treated at home, and during which he was nursed by his wife.

On 30th Nov., while her husband was convalescing, Mrs C. was seized with shivering, headache, and general aching, followed by febrile symptoms. A few days afterwards six of her seven children were similarly attacked, and on the 8th Dec. they were all sent to hospital. They all suffered from a sharp febrile attack of a fortnight's duration. The symptoms were so much alike in each that one case will illustrate the features of all. There were eight of them altogether treated in hospital.

CASE I.—J. C., aged 17, was seized on 3rd Dec. with shivering, headache, general pains, and sickness. Was admitted to hospital on 8th December.

9th Dec. (7th day of illness).—Did not sleep last night; complains much of intense headache; has febrile aspect; tongue furred; bowels not moved; has a short frequent cough; chest sounds normal; has had some epistaxis; has a sparse eruption

on the trunk of bright red spots, not elevated, disappearing on pressure. Temperature in morning  $103^{\circ}$ , in evening  $104^{\circ}1$ . To have milk and beef-tea.

10th Dec.—Has anxious expression; is quite intelligent. Had epistaxis three times in last twenty-four hours; bowels not moved; urine, sp. gr. 1031; no albumen. Temperature in morning  $104^{\circ}$ , evening  $103^{\circ}9$ . Rash as last noted. To have an aperient.

11th Dec.—Bowels moved by medicine; had considerable epistaxis during the night, and again this morning; temperature in morning  $103^{\circ}4$ , evening  $104^{\circ}2$ . To have 3ss. of liquid extract of ergot every three hours.

12th Dec.—Profuse epistaxis again during the night, and recurring during the day; temperature in morning  $102^{\circ}4$ , evening  $105^{\circ}1$ ; has no eruption; the red spots gone.

13th Dec. (11th day of disease).—Slept well; temperature in morning  $104^{\circ}$ , evening  $103^{\circ}8$ ; has no rash of any kind; bowels not moved since last action from aperient; repeat it.

14th Dec.—Has heavy listless aspect; sclerotics clear; answers intelligently; bowels moved; no rash; temperature in morning  $102^{\circ}8$ , evening  $103^{\circ}8$ ; no delirium.

15th Dec.—Fair night; general condition unchanged; no more epistaxis; no eruption on skin; temperature in morning  $103^{\circ}6$ , in evening  $103^{\circ}8$ .

16th Dec.—The same; temperature in morning  $103^{\circ}2$ , in evening  $104^{\circ}$ ; no stool; repeat aperient.

17th Dec. (15th day of illness).—No rash on skin; temperature in morning  $103^{\circ}4$ , evening  $103^{\circ}2$ .

18th Dec.—Temperature in morning  $102^{\circ}6$ , evening  $101^{\circ}9$ .

19th Dec.—Temperature in morning  $100^{\circ}2$ , evening  $100^{\circ}2$ .

20th Dec. (18th day of illness).—Temperature in morning  $98^{\circ}4$ , evening  $98^{\circ}6$ ; remained well; discharged on 4th January.

The admission of so many members of one family, all ill at the same time, and all suffering from fever, together with the statement that the father of the family was just recovering from typhus, naturally led to the supposition that that was the malady with which we had to deal in these cases, a supposition which was strengthened by its evident contagiousness. But when the whole of them were found to enter the second week of their fever without having developed the characteristic rash of that disease, it was evident that typhus was not the disease with which we had to do; for though typhus *sine eruptione* may occur, it is so extremely rare that the absence of the characteristic rash of typhus from all the members of the C. family may be accepted as conclusive evidence that that was not the form of fever from which they suffered. The natural alternative was to regard it as typhoid, for an attack of continued fever of more than a week's duration, which is not typhus, and which simultaneously



affects several members of the same family, is, as a rule, almost certainly typhoid. The occurrence of diarrhoea in Mrs C.'s case, and of epistaxis (a common symptom in typhoid) in several of the children, strengthened this view, and for a time they were looked upon as cases of typhoid. But when it was found that in not one of them did the spots characteristic of typhoid appear; that in none of them, except Mrs C. who died, were there any bowel symptoms; and, above all, when it was found that the mean duration of the fever was only fourteen days, it was evident that the cases were wanting in the features essential to the establishment of the diagnosis of typhoid. For though the absence of rose spots, the absence of bowel symptoms, and the absence of the usual third week of the disease, are all quite compatible with the diagnosis of typhoid in a given case, the coincident absence of all these common characteristics of the disease in so many members of one family, all ill at the same time, forms a strong body of evidence, if it is not absolutely conclusive, that they were not suffering from typhoid. But if neither typhus nor typhoid, What was it? There was no local inflammatory lesion to explain the febrile symptoms; there was no reason to suspect malaria; it was not relapsing fever; it was not any of the eruptive fevers; and yet it was evidently contagious. There seemed nothing to fall back on except cerebro-spinal fever. Such was the view to which I leaned, to which, indeed, I was driven by the apparent impossibility of its being anything else; but that disease is so rare in this country, and the course of the C. cases differed so from the conception which I had formed of the disease from what I had read of it; that it was not until other cases occurred, and the true nature of the disease was demonstrated in some of them by post-mortem evidence, that I felt quite satisfied that cerebro-spinal fever was the ailment from which the C. family had suffered.

Simultaneously with their illnesses occurred the following outbreak about a mile from them. At 21 Nelson Street resided a family of the name of M——. The family consisted of the father, aged 54, the mother, aged 49, three unmarried daughters, aged 25, 21, and 15, and one son, aged 17. A married daughter, Mrs D., with her husband and two children, resided a few doors off, at 27 Nelson Street. Between the M.'s and D.'s there was constant intercourse.

For three or four months prior to the illness of his family the father had been working as a labourer in Berwickshire, but came home for a short time during their illness. The eldest daughter, Jessie, resided not with her mother, but in lodgings in another part of the town, half a mile from her mother's house. It was this daughter who was the first to suffer. She began to ail about the middle of October (before the occurrence of the C.'s cases), and on the 26th of that month was brought to hospital by her mother and married sister, Mrs D., who had both been a good

deal with her during the two days immediately preceding her admission. The following are the notes of her case:—

CASE. II.—J. M., aged 25, was brought to hospital on the 26th October. Her friends could give no account of the commencement of her illness, but from the person with whom she lodged I learned that the illness began about a fortnight before admission, and that the early symptoms were shivering, intense headache, weakness, great thirst, and complete loss of appetite; after these symptoms had continued for a week or more she seemed to have some difficulty in speaking, and became very stupid. She had not spoken for two days before admission to hospital. Her mother and sister were sent for after she had been ill about a week, and were a good deal with her during the two days preceding her removal.

26th Oct.—State on admission:—Patient is very dirty; is quite conscious but does not speak; cheeks flushed; eyes suffused; tongue dry; pulse, 108, weak and intermittent; respirations, 48; temperature,  $101^{\circ}$ ; chest normal; no cardiac bruit; no rash on skin; no iliac tenderness or cæcal gurgling; bowels said to have been moved two days ago; swallows with difficulty, and only a teaspoonful of milk or beef-tea at a time. To have beef-tea enemata.

27th Oct.—Quiet night; occasionally passes water in bed; face flushed; eyes suffused; pupils natural; pulse, 100; temperature in morning  $100^{\circ}\cdot8$ , in evening  $102^{\circ}$ ; urine normal; nothing on skin; to have five grains calomel; the head to be shaved, and a blister  $3 \times 4$  to be applied long enough to redden, but not to blister the surface.

28th Oct.—Quiet night; one natural stool; temperature in morning  $100^{\circ}\cdot6$ , evening  $100^{\circ}\cdot2$ ; general condition unchanged; tongue dry.

29th Oct.—Slept well; pulse, 108; respirations, 36; temperature  $100^{\circ}\cdot2$  (in evening  $100^{\circ}\cdot6$ ); skin moist; no rash; distinct tache cerebrale; water passed at times in bed, sp. gr. 1035, no albumen.

30th Oct.—Passes water naturally; has no pain; is very thirsty; temperature in morning  $99^{\circ}\cdot2$ , evening  $98^{\circ}\cdot8$ .

1st Nov.—Improved aspect; tongue moistening; bowels moved three times; one stool passed in bed; pulse, 104, of better character; temperature in morning  $98^{\circ}\cdot8$ , evening  $98^{\circ}\cdot4$ .

The patient remained under observation in the hospital till the 4th Jany. 1878, with little or no change in her general condition; the temperature continued normal. On 8th Nov. there was some discharge of blood per vaginam, but no appearance of pain or discomfort; it continued on the 9th, and was supposed to be catamenial; but on the 10th the nurse found a foetus of about three months in the bed. This made no change in her symptoms or condition, and apparently gave rise to no discomfort. On 16th



Nov. it is noted, "Continues in the same listless apathetic state, taking no interest in anything; pulse, 120, of fair strength; chest normal; has no pain; sleeps well; bowels constipated."

From time to time she passed water in bed apparently from sheer apathy. The bowels were generally confined, calling for aperients. She took ordinary diet well, and helped herself. She seemed dull, stupid, and absent; and though she put out her tongue when told, and seemed to understand what was said to her, did not answer. At the beginning of December a slight mattery discharge came from the nose, and continued for two or three days. Treatment consisted locally in the application of blisters and even of a seton. Internally the iodide and bromide of potass, and latterly strychnine were given, but she remained in the same condition, uninfluenced by treatment, and was sent to the poor-house on the 4th Jany.; four days afterwards she was sent from there to the asylum. Dr Rorie, the superintendent, informed me that she suffered from melancholia attonita, a state closely resembling acute dementia, and did not speak for a fortnight after admission. She gradually recovered, and was discharged well on the 14th Sept., nearly nine months after she left hospital.

A year later, on 12th Sept. 1879, she was readmitted to the asylum suffering from puerperal mania, from which she also recovered.

This was a very obscure case. There was no renal disease; she was not at an age at which tubercular mischief is likely to affect the membranes of the brain; there was no history or appearance of syphilis or of accident; and she was not suffering from any of the common specific fevers of this country. That the girl was gravely ill there could be no doubt, and the symptoms all pointed to some form of intra-cranial mischief, evidently of inflammatory origin. Taking the case as an isolated one, and having regard only to what was personal to the patient, no more definite diagnosis could be formed, and none other was formed during her stay in hospital; but regarding it in the light thrown upon it by the subsequent illnesses of the other members of the family, there can be no doubt that the case was one of cerebro-spinal fever, for we find within a few weeks of her illness eleven cases of that disease occurring in persons who had been directly or indirectly in contact with her.

The contagious nature of her illness not being known, she was placed in a general medical ward, and her friends allowed to visit her. Those who came were her mother and married sister, Mrs D. Jessie M. was admitted on the 26th Oct., and was frequently visited by her mother and sister. Her mother, Mrs M., began to ail on the 19th Nov.; her sister, Mrs D., began to ail on the 11th Dec.; her sister, Margaret M., began to ail on the 20th Dec.; her sister, Mary M., began to ail on the 21st Dec.; her

niece, Margaret D., began to ail on the 13th Jan.; her niece, Christina D., began to ail on the 14th Jan. All their illnesses commenced with shivering, headache, and more or less sickness, and all consisted essentially of a febrile attack of about two weeks' duration.

The father, Alex. M., came home on the 31st Dec., and remained with his family, then ill, till the 9th Jan., when he returned to his work at Reston Hill, in Berwickshire. There he was seized on the 19th of Jany., ten days after his return, with shivering, sickness, and headache. He had no medical attendance; but his sister, with whom he resided, and to whom I wrote for information, told me that "he took it with a shaking of cold and a pain in his head, and that the first week he was in bed he threw up everything, even a drink of water." He was confined to bed for a month, and got up for the first time on the 10th of Feby. He remained weak for a long time.

His son, the only one of the M.'s who escaped, left home and went into lodgings when his mother took ill in Nov.

Next door to the D.'s lived James K., his wife, and three children—Elizabeth aged 6, Joseph aged 4, and Charles aged 11 months. The D. and K. children were a great deal together. About the third week in December Elizabeth K. took ill; her symptoms were shivering, sickness, and intense headache, followed by fever, a short cough, and great thirst. She was treated at home, but had no medical attendance; she was in bed for nearly three weeks. About the second week in January her brother Joseph was seized with the same symptoms as his sister,—shivering, sickness, and headache. His mother informed me that Joseph had spots on his skin, but his sister had not. As he seemed worse than his sister, a medical man was sent for, who thought the boy had typhoid fever, and sent him to hospital, where he came under my care. On the 10th February the father, James K., was seized in the same way as his children, and was also sent to hospital. A sister of his, Mary K., aged 22, residing in another part of the town, went to see her brother on several occasions during the days preceding his removal to hospital. She shivered on the 23rd February, and went through an attack of fever differing in no respect from that from which her brother suffered. She was attended at home by Dr Steel-Moon, by whose courtesy I also saw her several times during her illness. It was a well-marked case of cerebro-spinal fever. Mrs K. escaped.

The three families to which this outbreak was limited consisted of sixteen people,—six M.'s, four D.'s, and six K.'s,—of these twelve suffered and four escaped. The disease did not spread among the neighbours, but was confined to those who were brought into direct and personal contact with previous sufferers. Of the occurrence of the first case, that of Jessie M., no explanation

could be given; the other eleven are all traceable back more or less directly to infection derived from her.

CASE III.—Mrs M., aged 49, mother of Case II., brought her to hospital on Oct. 26th, and was a good deal with her on the 24th and 25th Oct., and saw her several times in hospital. On 19th Nov. she was seized with shivering, sickness, and severe headache. On the 20th she took to bed. The sickness and headache continued, febrile symptoms and great prostration followed, and on 27th Nov., the ninth day of her illness, she was brought to hospital.

27th Nov.—Has febrile aspect; is dull and breathes heavily; is very deaf, has been so only since illness, not before; face flushed; eyes suffused; tongue very dirty; pulse, 120, feeble; temperature,  $102^{\circ}6$ ; no eruption on skin.

28th Nov.—Restless night; tongue thickly furred, dry in centre; no rash; has slight cough; chest sounds natural; urine, sp. gr. 1019, albuminous, deposits urates on standing; pulse, 120; temperature,  $102^{\circ}$ ; evening: pulse, 128; temperature,  $102^{\circ}2$ . To have milk and beef-tea, and water *ad libitum*.

29th Nov. (11th of disease).—Tongue dirty and dry in centre; is very restless; skin covered with purple spots of different shapes and sizes, not elevated, disappearing on pressure; no other rash; bowels confined; pulse, 132; temperature,  $101^{\circ}6$ ; in evening, 128 and  $102^{\circ}$ .

30th Nov.—Slept fairly well; spots all gone from skin; tongue moistening; pulse, 120, feeble; temperature,  $99^{\circ}$ ; to have  $\frac{3}{4}$ iv. of wine. Vesp.: pulse, 116; temperature,  $100^{\circ}6$ .

1st Dec. (13th of disease).—Restless night; is sunk and apathetic; tongue dry; breathes heavily; chest normal; bladder distended, 50 ounces of water drawn off by catheter; urine has trace of albumen; nothing on skin; pulse, 112, feeble; temperature,  $97^{\circ}4$ ; wine to 6 ounces; cup of milk or beef-tea every two hours. Vesp.: pulse, 104; temperature,  $99^{\circ}6$ .

2nd Dec.—Still requires catheter; urine has trace of albumen, and deposits urates on standing; pulse, 120; temperature,  $97^{\circ}$ ; in evening, 120 and  $99^{\circ}4$ .

3rd Dec.—Has had no sleep; is much depressed and sunk; tongue dry; nothing on skin; pulse, 112, feeble; cardiac systole feeble; temperature,  $99^{\circ}6$ ; still requires catheter; to have champagne frequently. Vesp.: is very restless, tossing arms about; distinct subsultus; pulse, 124; temperature,  $99^{\circ}6$ ; to have 30 grains of chloral with the same quantity of bromide of potass, to be repeated in three hours if required.

4th Dec. (16th day).—Slept after second draught; looks better; tongue dirty; no eruption; pulse, 120; temperature,  $100^{\circ}$ . bowels confined; requires catheter. Vesp.: pulse, 120; temperature,  $98^{\circ}6$ .

5th Dec.—Slept all night without draught; is heavy, drowsy,



and apathetic ; bowels confined ; still requires catheter regularly ; pulse, 116 ; temperature,  $97^{\circ}6$ . Vesp. : pulse, 120 ; temperature,  $97^{\circ}8$ .

*6th Dec.*—Had a good night ; expression improved ; answers questions ; tongue moistening ; bowels moved after medicine ; requires catheter ; pulse, 112 ; temperature,  $98^{\circ}$  ; in evening, 116 and  $98^{\circ}2$ .

*7th Dec.*—Sleeps well ; generally improving ; tongue cleaning ; pulse, 104 ; temperature,  $97^{\circ}6$  ; evening, 104 and  $98^{\circ}8$ .

*8th Dec.*—Sleeps a great deal ; made water for first time without the catheter ; tongue clean ; pulse, 104 ; temperature,  $97^{\circ}2$  ; evening, 96 and  $97^{\circ}6$ .

She steadily gained ground, and was discharged well on 29th Dec.

CASE IV.—Mrs D., aged 27 (daughter of last case), had been much fatigued and upset by attendance on her mother during first week of her illness. She herself began to ail on 12th Dec. Illness commenced with vomiting, and pains all over her, but no rigor. Came to hospital on 17th.

*17th Dec.* (6th day of disease).—Vesp. : face flushed ; eyes slightly suffused ; tongue furred ; has a rash on the body which cannot be distinctly seen in the evening ; pulse, 108 ; temperature,  $104^{\circ}8$ .

*18th Dec.*—Slept badly ; complains of intense headache ; face flushed ; pupils natural ; tongue moist ; the face, arms, and to a less extent the trunk and thighs, are studded over with an eruption of light red spots (rose-coloured), not elevated, disappearing on pressure, and of no regular shape ; pulse, 104 ; temperature,  $104^{\circ}8$ . Vesp. : pulse, 104 ; temperature,  $105^{\circ}$ . Patient is quite intelligent ; both she and the nurse say that the spots on arms and legs come and go ; they were very numerous in the afternoon on the arm, and each about the size of a pea. Complains a good deal of pain all over ; both muscles and skin are hyperesthetic ; can lie only on her back, she feels so aching and sore when on her side.

*19th Dec.*—Slept a little during night ; cheeks more deeply flushed ; has anxious expression and very distressed aspect, but says she has less pain ; no sickness ; no tenderness of neck or spine ; is very restless ; the same rosy-red rash on trunk, arms, and thighs ; has troublesome cough ; chest sounds normal ; bowels confined ; to have aperient, and 30 grains of bromide of potass three times a day. Morning : pulse, 104 ; respirations, 42 ; temperature,  $104^{\circ}3$ . Evening : pulse, 100 ; respirations, 40 ; temperature,  $104^{\circ}8$ .

*20th Dec.*—Restless night ; not wandering ; bowels moved ; has had slight epistaxis. Seems oppressed and heavy, but intellect is quite clear ; eyes natural ; cough is more troublesome, and there is a scanty viscid colourless expectoration ; percussion and auscultation natural ; rash less distinct ; urine contains trace of albumen ;

pulse, 108; respiration, 42; temperature,  $103^{\circ}2$ . Vesp.: pulse, 104; respiration, 48; temperature,  $103^{\circ}8$ ; cough very troublesome; rash brighter, in vivid red spots. To have 20 mm. of Tr. Camph. Co. every four hours.

*21st Dec.*—Slept from time to time, but coughed a great deal during the night. Is quite intelligent; has anxious and distressed expression; dusky flushing of face; tongue and lips dry. Says she is "sore all over," and everywhere is preternaturally sensitive to touch; says "she hasn't breath;" breathing short and frequent, the air cells being apparently only partially filled; percussion and auscultation show nothing abnormal; heart sounds normal; pulse, 112; respirations, 60; temperature,  $103^{\circ}2$ . To have ice cap to head, and 30 grains of chloral at once, and a second dose in three hours if required. Vesp.: slept for an hour and a half after second dose of chloral; cough is less troublesome; has pains in body, but none in head; still complains of having no breath; pulse, 112; respirations, 72; temperature,  $103^{\circ}8$ . To have chloral and bromide draught.

*22nd Dec.* (11th of illness).—Slept better; tongue moist; cheeks flushed; pupils natural; has less cough; no pain; rash fading; pulse, 112; respirations, 64; temperature,  $102^{\circ}5$ . Vesp.: pulse, 112; respirations, 60; temperature,  $104^{\circ}1$ .

*23rd Dec.*—Slept well after draught containing 30 grains of chloral and the same quantity of bromide of potass; is quieter and quite sensible; coughs less; rash nearly gone; tongue dry; no stool; complains of sore throat; pulse, 108, of better character; respirations irregular, about 60; temperature,  $103^{\circ}$ . Evening: pulse, 104; respirations, 60; temperature,  $104^{\circ}2$ .

*24th Dec.*—Slept well, face less flushed; tongue moist; throat better; one natural stool; feels all sore, but has no localized pain; rash is now only a faint livid mottling; pulse, 108; respirations, 60; temperature,  $103^{\circ}$ . Vesp.: pulse, 108; respirations, 60; temperature,  $103^{\circ}8$ .

*25th Dec.* (14th of illness).—Quiet night; feels very wretched, but has no pain; tongue dry; rash all gone; pulse, 104; respirations, 40; temperature,  $101^{\circ}8$ . Vesp.: pulse, 104; respiration, 52; temperature,  $103^{\circ}1$ .

*26th Dec.*—Passed a quiet night; urine contains trace of albumen; pulse, 108; respirations, 48; temperature,  $100^{\circ}4$ . Vesp.: pulse, 104; respirations, 48; temperature,  $101^{\circ}6$ .

*27th Dec.*—Sleeps a great deal; urine normal; tongue moist; pulse, 104; respirations, 40; temperature,  $99^{\circ}8$ . Vesp.: pulse, 104; respirations, 44; temperature,  $101^{\circ}2$ .

*28th Dec.*—Continues to improve; sleeps well; pulse, 100; respirations, 36; temperature,  $99^{\circ}6$ . Vesp.: pulse, 104; respirations, 38; temperature,  $99^{\circ}5$ .

*29th Dec.*—Pulse, 104; respirations, 36; temperature,  $98^{\circ}6$ . Vesp.: pulse, 92; respirations, 36; temperature,  $99^{\circ}8$ .



30th Dec.—Pulse, 96; respirations, 32; temperature, 98°·8.  
Vesp.: pulse, 92; respiration, 34; temperature, 98°·4.

31st Dec.—Pulse, 92; respirations, 32; temperature, 98°·4.

Convalesced steadily, and made a good recovery.

CASE V.—J. K., aged 4, lived close to the D.'s, and was much with them. About the middle of January illness commenced with vomiting and pain in head and back. For several days before admission was delirious and calling out as if in pain. His mother noticed for the first time on the day before his admission to hospital that his body was dotted over with red spots. Was brought to hospital on 24th Jany.

24th Jany.—Is very restless; tongue dry; breathing very hurried, expiration forcible and short; chest normal; eyes clear; over trunk and limbs is a sparsely distributed red rash, not elevated, disappearing on pressure; temperature, 102°·8 (evening).

25th Jany.—Is restless and distressed; has a few red spots on body about the size of a split pea, irregular in outline, disappearing on pressure, and not elevated; to have milk and beef-tea; body to be sponged; and to have 6 grs. of bromide of potass every three hours; pulse, 136; respirations, 48; temperature, 101°·5.  
Vesp.: pulse, 136; respirations, 40; temperature, 101°.

26th Jany.—Pained and distressed aspect; restless night; is quite conscious; scanty rash of red spots as last noted; head is retracted; nurse states that the back is sometimes arched; one stool, natural in colour and consistence; urine has faint trace of albumen, sp. gr., 1030; pulse, 136; respirations, 40; temperature, 101°·2. Vesp.: pulse, 132; respirations, 38; temperature, 100°·2.

27th Jany.—Quiet night; head retracted and spine arched; muscles do not feel stiff; eruption paler, similar in character; pulse, 124; respirations, 48; temperature, 102°·4. Vesp.: pulse, 130; respirations, 44; temperature, 101°·6.

28th Jany.—Quiet night; no arching of back; is very weak and depressed; does not take nourishment well; rash less distinct and less of it; wine,  $\mathfrak{z}$ iv.; pulse, 138; respirations, 40; temperature, 102°. Vesp.: pulse, 132; respirations, 40; temperature, 103°.

29th Jany.—Pinched expression and sunken aspect; eyes clear; is very weak; cannot open mouth, apparently from trismus; rash as yesterday; pulse very feeble, 136; respirations, 32; temperature, 102°·4. Vesp.: pulse very feeble, 136; respirations, 40; temperature, 102°·6.

30th Jany.—Pinched and depressed aspect; very quiet and prostrate, can scarcely swallow; beef-tea enemata, with wine; pulse scarcely perceptible; respirations irregular; temperature in morning, 102°·5; in evening, 101°·6.

31st Jany.—Sinking; nothing on skin; is almost unconscious; temperature in morning, 101°·4; in evening, 101°.

1st Feby.—Died at 5.40 A.M. Post-mortem thirty hours after

death. No eruption, no markings on skin; no rigidity; decided incurvation of great toes (pedal contraction). Heart and lungs normal; liver slightly enlarged; spleen rather soft; kidneys slightly congested; intestinal glands, solitary and agminated, quite natural in appearance.

The only abnormalities were found in the head. On removing the calvarium, the dura mater presented a normal appearance; but on opening the membranes there flowed away a largely increased quantity of cerebro-spinal fluid. There was no general congestion, or undue fulness of the sinuses; the choroid plexus was normal; and there was no increase of fluid in the ventricles. The pia mater covering the posterior lobes of the cerebrum was abnormally and minutely injected, and presented on its surface numerous spots both of redness and of haziness,—the former congestive, the latter lymph. The base of the brain was natural in appearance, as also was the substance of the cord. The only abnormalities were the large increase of cerebro-spinal fluid, and the marked injection of the pia mater covering the posterior lobes.

At 5 Bruce Street resided J. O'N., his wife, and two sons, John, aged 20, and James, aged 13. In the second week of November John was seized with an illness which commenced with shivering and pain in the head and back, and was characterized during its course by fever and prostration. He was in bed for three weeks, and off work for six. He had spots on his skin. James took ill in the same way at the end of November, and had a similar illness lasting for six weeks altogether. The father was similarly seized on the 30th December, but continued at work till the 5th January. He felt very weak and ill for some weeks. Spots were not noted either in his case or James'. Mrs O'N. took ill the same day as her husband, and was sent to hospital on the 7th January.

CASE VI.—C. O'N., aged 50, was seized on 30th Dec. with shivering, sickness, and severe headache. Since then has had pains all over, and general prostration. The bowels have been loose.

*7th Jany.*—State on admission. Is a little deaf, but perfectly intelligent; eyes clear; tongue very dirty; has a slight cough; chest sounds normal; has a rash on skin which disappears on pressure, but not well seen by gaslight; pulse, 112; respirations, 34; temperature (in evening),  $104^{\circ}\cdot8$ .

*8th Jany.* (10th of illness).—Was rather restless; tongue dirty; urine albuminous, sp. gr. 1021. Over skin of trunk, both before and behind, is a sparse eruption of rose-red spots, of irregular outline, not elevated, disappearing on pressure; pulse, 112; temperature,  $103^{\circ}\cdot4$ . Vesp.: pulse, 116; temperature,  $103^{\circ}\cdot2$ .

*9th Jany.*—Restless night; tongue thickly furred; bowels freely

moved once ; rash quite gone ; pulse, 120 ; temperature, 103°. Vesp. : pulse, 120 ; temperature, 104°·2.

10th *Jany.*—Expression natural ; intellect quite clear ; tongue dry. The rash has come out again over the trunk in the form of light red spots, varying in size, of irregular outline, not elevated, disappearing on pressure ; pulse, 120 ; temperature, 103°·2. Vesp. : pulse, 118 ; temperature, 104°·2.

11th *Jany.*—Passed a quiet night ; is quite intelligent ; is sore all over ; skin hyperæsthetic ; rash the same as yesterday ; pulse, 116, feeble ; temperature, 103°. To have 4 ounces of wine. Vesp. : pulse, 120 ; temperature, 103°·4.

12th *Jany.*—Wanders at times ; distinct muscular startings and twitchings ; is not delirious ; tongue dry ; rash unchanged ; pulse, 120 ; temperature, 102°·2. Vesp. : pulse, 100 ; temperature, 102°·4.

13th *Jany.* (15th of illness).—General condition the same ; pulse, 112 ; respirations, 32 ; temperature, 102°·4. Vesp. : pulse, 108 ; respirations, 30 ; temperature, 103°·2.

14th *Jany.*—Passed a good night ; has improved expression, and says she feels better ; tongue moist at edges ; rash fading ; pulse, 120 ; respirations, 28 ; temperature, 99°·4. Vesp. : pulse, 100 ; respirations, 24 ; temperature, 100°·8.

15th *Jany.*—Continues to improve ; rash gone ; pulse, 104 ; respirations, 22 ; temperature, 98°. Vesp. : pulse, 92 ; respirations, 24 ; temperature, 99°·6.

16th *Jany.*—Pulse, 92 ; temperature, 97°. Vesp. : pulse, 88 ; temperature, 99°·2.

17th *Jany.*—Pulse, 96 ; temperature, 97°·4. Vesp. : pulse, 92 ; temperature, 99°·4.

18th *Jany.*—Morning temperature, 97°·6 ; evening, 99°·2.

19th *Jany.*—Morning temperature, 99°·2 ; evening, 99°·4.

20th *Jany.*—Morning temperature, 97°·1 ; evening, 98°·4.

Mrs O'N.'s was an undoubted case of cerebro-spinal fever, with the characteristic rose rash of that disease. There is no reason to doubt that her husband and sons suffered from the same disease ; and this view was taken by the medical man (Dr Young) who saw them during their illness. At the time he naturally enough thought that they were suffering from typhus, which is common in Dundee ; but on hearing of the nature of Mrs O'N.'s illness, said he had no doubt that theirs was the same.

At 2 Glamis Street resided G. M., with his wife and two children,—Isabella aged 14, and Charles aged 12. In the second week of January Isabella was seized with rigors, headache, sickness, and pains all over. Was conscious and intelligent all through her illness. She was confined to bed for a fortnight. She was seen several times by Dr Steel-Moon, who said that she had no spots on the skin, and regarded her case at the time as a mild attack of typhoid. The illness of her parents coming immediately



after leave little room for doubt that her fever, like theirs, was cerebro-spinal, and in this view Dr Moon concurred.

CASE VII.—C. M., aged 55, the mother of the girl referred to, was seized on the 3rd February with sickness, a feeling of cold, and pain in head and side. Had been looked after by some neighbours, who stated that she had been restless, sleepless, and very confused. They volunteered the statement that her head had been drawn back. Was sent to hospital on 8th day of illness.

10th Feby. (8th day of illness).—Has febrile aspect; intellect clear; tongue dry; eyes not injected; pulse, 116; respirations, 28; temperature (evening),  $103^{\circ}$ . On the trunk and extremities is an indistinct rash (to the eye not unlike typhus mottling) consisting of spots which vary in size, are not elevated, and disappear on pressure. Urine contains a considerable quantity of albumen; sp. gr., 1024.

11th Feby.—Quiet night, wandering at times; answers rationally; is depressed and sunk in bed; pupils small; rash unchanged; has several small petechial spots on hips; bladder distended and requiring catheter; cardiac systole feeble; pulse, 116, feeble; respirations, 30; temperature,  $102^{\circ}8$ . To have milk and beef-tea frequently, and half an ounce of wine every two hours. Vesp.: pulse, 132; respirations, 36; temperature,  $103^{\circ}8$ .

12th Feby.—Passed a quiet night, but moaning at times; is much sunk in bed; takes no notice of anything, and makes no response when spoken to. Rash not so distinct; petechiæ unchanged; urine albuminous, sp. gr., 1023; requires catheter; bowels moved once. Pulse, 132, very feeble; respirations, 32; temperature,  $103^{\circ}$ . To have whisky instead of wine, a dessert-spoonful every hour. Vesp.: pulse, 140; respirations, 36; temperature,  $103^{\circ}4$ .

13th Feby. (11th of illness).—Except for moaning has passed a quiet night; is much sunk; face dusky; rash almost gone—but there remain a number of petechial spots on hips; pulse irregular and scarcely perceptible; temperature,  $101^{\circ}6$ .

Gradually sank and died in the afternoon.

*Section* forty-two hours after death. The head only was examined. There was nothing peculiar or abnormal in the external appearance of the dura mater. On opening it there flowed away a much more than normal quantity of cerebro-spinal fluid. On removing it, the pia mater covering the whole of the upper surface of the cerebral and cerebellar lobes was seen to be the seat of a bright red congestion of its minute bloodvessels, the course of which could easily be traced by the naked eye. The whole surface was markedly and minutely injected, with here and there milky-looking patches of lymph effusion. These patches varied in size from mere dots to bits as large as a sixpence, but of irregular shape. The ventricles and choroid plexus were normal in appearance, and there was no

congestion of the interior of the cerebral or cerebellar substance. The only abnormalities were the minute capillary injection of the pia mater, lymphic effusion into its meshes, and the increased quantity of cerebro-spinal fluid.

Her husband recovered from his fever, but died of erysipelas during convalescence.

There can be no doubt that the three members of the M. family all suffered from the same disease. The diagnosis of cerebro-spinal fever was made during life, and in Mrs M.'s case was verified by examination after death. Mr M.'s case bore a strong resemblance to typhus; and occurring alone, or still more during the prevalence of typhus, would almost certainly have been taken for that disease, so closely did the rash to the eye resemble that of typhus. The points wherein it differed from it were—(1.) That it did not come out till the eighth day; (2.) That at that time it disappeared on pressure, though a few days later it only faded; and (3.) That all through the illness it was more vivid in colour than is the typhus rash.

It is to be noted, too, that in Mrs M.'s case the rash was more scanty, but the cerebral symptoms and general severity of the malady much greater than in the case of her husband, who had a very copious eruption, but got well over his fever, dying of a sequela. In typhus the copiousness of the eruption is directly as the severity of the seizure—a scanty eruption indicating a mild attack.

Unfortunately the friends who in Mrs M.'s case sanctioned only the examination of the head, in her husband's case refused to allow even that.

At 26 Foundry Lane resided Mrs B., with one son and three daughters, H., C., and J. They lived in one room. H. B., aged 17, was seized on the 2nd February with shivering, sickness, and pain in the head and back. Her brother G. was similarly seized on the 23rd, Mrs B. on the 24th, and C. on the 26th February. They were all treated in hospital, and were all well-marked cases of cerebro-spinal fever, with the rash, the hyperesthesia, the general distress, the cerebral breathing, all well marked; they had also very free desquamation of the skin. I give Mrs B.'s case, because of its unique mode of fatal termination.

CASE VIII.—Mrs B., aged 47, was seized on 24th February with shivering, sickness, and pain in head and limbs. Came to hospital five days after.

*1st March* (sixth day of illness).—Is quite sensible; cheeks flushed; eyes and expression natural; breathes quietly; has no cough; urine contains a good deal of albumen, sp. gr. 1018; bowels moved by medicine. Pulse (vespere), 116; respirations, 28; temperature, 101°·8.

*2nd March*.—Passed a quiet night; tongue moist; eyes suffused; has slight wheeze in chest; on both cheeks, on chin, and



on throat, but nowhere else, is a bright roseolar rash; the spots vary in size, have no regular outline, disappear on pressure, and are not elevated above the surface; bowels moved; pulse, 108; respirations, 26; temperature,  $102^{\circ}4$ . Vesp.: pulse, 112; respirations, 28; temperature,  $103^{\circ}4$ .

*3rd March*.—Passed a quiet night; still has rash on neck and face, nowhere else; tongue moist and dirty; eyes natural; has distressed aspect; pulse, 108; respirations, 24; temperature,  $102^{\circ}4$ . Vesp.: pulse, 112; respirations, 24; temperature,  $102^{\circ}8$ .

*4th March* (ninth day of illness).—Was restless and distressed during the night; got much worse early in the morning, and at 6.30 A.M. the resident medical officer was sent for. He found her cold, pale, and evidently sinking. The pulse could not be felt; the temperature was  $98^{\circ}$ . She was freely stimulated, but gradually sank, and died at 8.30.

*Post-mortem*, twenty-seven hours after death. Livid discoloration of shoulders, back, and hips, evidently post-mortem. No spots or other marks on skin.

*Chest*.—Heart soft and pale; lungs normal.

*Abdomen*.—On opening this the peritoneal cavity was seen to contain a large quantity of dark blood, liquid and clotted. A large clot lay in the pelvis. The spleen was found to be ruptured; its substance was soft, diffuent, and of a mahogany colour. Over it was a firm dark clot of blood, which fitted on to its surface, and took the shape of the spleen. It had formed under the capsule, a detached piece of which, about an inch square, lay on its surface. The liver was soft, and of a mahogany colour; weight, 59 ounces. The kidneys were darker in colour than natural. The abdominal glands were not enlarged. The intestinal glands were quite healthy.

*Head*.—The dura mater was of normal appearance. There was slight venous congestion of cerebral surface, and a rather more than normal quantity of cerebro-spinal fluid, but nothing very marked. There was distinct, but by no means excessive congestion of the minute vessels of the pia mater covering the upper surface of the cerebral and cerebellar lobes. The whole cerebral surface was covered with a milky haziness, most marked along the course of the vessels. The ventricles and cerebral substance were normal in appearance. There was no increased size of choroid plexus. The veins of the spinal cord were more than usually loaded, and there was increased vascularity of the membrane covering the cervical and lumbar portions.

Rupture of the spleen has been known to occur in typhus, in typhoid, and in relapsing fever. In all it is a rare accident. This is the only instance of its occurrence in cerebro-spinal fever of which I am aware.

Next door to the B.'s a boy named Page also had the fever, and was treated in hospital.

CASE IX.—C. D., aged 17, resided in the hospital, and had been for a month a scrubber in the ward in which the females whose cases have been given were treated. On the 6th February she was seized with shivering, sickness, and pain in the head, back, and legs.

*8th Feb.* (third day of illness.)—Has heavy febrile aspect; intellect quite clear; face flushed; tongue moist, pretty clean; bowels moved by medicine; has a short cough; there is slight wheeze in chest; has considerable thirst; no eruption; urine, sp. gr., 1034; abundant deposit of urates on standing, contains a trace of albumen; temperature in morning,  $102^{\circ}8$ . Vesp.: pulse, 120; respirations, 28; temperature,  $103^{\circ}4$ .

*9th Feb.*—Restless night; no cough; no rash; tongue furred; pulse of fair strength, 112; respirations, 36; temperature,  $103^{\circ}2$ . Vesp.: pulse, 120; respirations, 32; temperature,  $103^{\circ}8$ . To have 30 grains of chloral and bromide of potass.

*10th Feb.* (fifth day of illness.)—Slept fairly; has natural expression; bowels moved once. Over whole of body is a bright red roseolar rash, consisting of spots which vary in size, are irregular in outline, are not elevated, and disappear on pressure. Pulse, 120; respirations, 30; temperature,  $103^{\circ}8$ . Vesp.: pulse, 120; respirations, 30; temperature,  $104^{\circ}6$ . Repeat draught.

*11th Feb.*—Restless night, very little sleep; expression natural; eyes natural; intellect clear; tongue dry in centre; rash same as yesterday; urine contains trace of albumen. Pulse, 124; respirations, 32; temperature,  $103^{\circ}6$ . To have 30 grains Sod. salicyl. every three hours. Vesp.: pulse, 112; respirations, 28; temperature,  $104^{\circ}$ .

*12th Feb.*—Better night; feels sore all over; abundant rash, to the eye like that of typhus, only brighter in colour, and disappearing on pressure; urine, sp. gr. 1030, slightly albuminous, and depositing urates on standing. Pulse, 132; respirations, 32; temperature,  $104^{\circ}4$ . Vesp.: pulse, 132; respirations, 32; temperature,  $104^{\circ}6$ .

*13th Feb.*—Slept fairly without draught; is quite intelligent; tongue dirty, dry in centre; sclerotics clear, pupils large; rash as yesterday; skin of trunk markedly hyperæsthetic; muscles tender to touch; bowels moved. Pulse, 124; respirations, 32; temperature,  $104^{\circ}2$ . Vesp.: pulse, 120; respirations, 28; temperature  $104^{\circ}6$ .

*14th Feb.*—Slept fairly well; complains much of pain in legs; rash and general condition unchanged. Pulse, 120; respirations, 28; temperature,  $103^{\circ}4$ . Vesp.: pulse, 120; respirations, 28; temperature,  $104^{\circ}$ .

*15th Feb.*—Fair night; tongue dry in centre; rash gone from limbs, and less of it on trunk, the same in character; skin of forehead peeling; cardiac systole feeble. Pulse, 132; respirations, 34; temperature,  $102^{\circ}8$ . Wine,  $\frac{3}{4}$ iv. Vesp.: pulse, 128; respirations, 36; temperature,  $103^{\circ}8$ .

16th Feb. (eleventh day of illness.)—Slept well; eyes suffused; tongue dry; rash as last noted; slight peeling of skin of wrists and forearms, as well as of face; slight wheeze over chest. Pulse, 124; respirations, 28; temperature,  $102^{\circ}4$ . Vesp.: pulse, 124; respirations, 36; temperature,  $103^{\circ}4$ .

17th Feb.—Slept well; tongue moist at edges; bowels rather loose; rash fading; skin hyperæsthetic. Pulse, 116; respirations, 36; temperature,  $102^{\circ}$ . Vesp.: pulse, 120; respirations, 36; temperature,  $102^{\circ}6$ .

18th Feb.—Slept well; rash fading; still a few isolated spots partially disappearing on pressure. Pulse, 116; respirations, 36; temperature,  $101^{\circ}2$ . Vesp.: pulse, 116; respirations, 32; temperature,  $102^{\circ}8$ .

19th Feb.—Restless night; troublesome cough; sibilation all over chest; rash all but gone; skin of forearms desquamating freely. Pulse, 110; respirations, 36; temperature,  $101^{\circ}$ . Vesp.: pulse, 112; respirations, 36; temperature,  $102^{\circ}$ .

20th Feb.—Slept well; wheezing in chest; stupe to be applied. Pulse, 104; respirations, 40; temperature,  $100^{\circ}$ . Urine albuminous, sp. gr. 1030, deposits urates on standing. Vesp.: pulse, 108; respirations, 36; temperature,  $101^{\circ}$ .

21st Feb. (sixteenth day of illness).—Rash quite gone; skin desquamating; tongue dry in centre; slight wheezing all over chest. Pulse, 112; respirations, 32; temperature,  $99^{\circ}2$ . Vesp.: pulse, 108; respirations, 32; temperature,  $100^{\circ}$ .

22nd Feb. — Pulse dicrotous; forearms desquamating very freely; has a few sudamina on chest; urine contains trace of albumen and deposits urates. Pulse, 108; respirations, 28; temperature,  $98^{\circ}6$ . Vesp.: pulse, 100; respirations, 26; temperature,  $99^{\circ}4$ .

23rd Feb. (eighteenth day of illness).—Desquamating freely all over; omit wine. Pulse, 100; respirations, 24; temperature,  $98^{\circ}2$ . Vesp.: pulse, 96; respirations, 24; temperature,  $98^{\circ}4$ .

The temperature remained normal, and she convalesced well. During the early part of convalescence the kidneys acted very freely, and she passed large quantities (from 70 to 90 ounces per diem) of water, pale, of low specific gravity, and depositing on standing epithelial *débris*. On 8th March she passed 88 ounces; on the 10th, 80 ounces; on the 11th, 76 ounces; it gradually fell to the normal quantity.

This was the only case contracted in the house. As already stated, her duties were to clean the ward in which the cases already reported were treated.

CASE X.—W. C., aged 12, came to hospital on the 11th October 1878. Could give no very satisfactory account of his illness. He is very deaf, and even when made to hear, answers only half intelligently. Has depressed aspect; eyes suffused; abdomen tumid and tender to touch; tongue dirty; bowels moved once naturally.



Temperature (in evening),  $102^{\circ}6$ . Has several rose-coloured spots on abdomen.

12th Oct.—Four stools since admission; tongue dry. Pulse, 116, feeble; temperature,  $101^{\circ}$ ; abdomen tumid and tender. Vesp.: pulse, 120; temperature,  $103^{\circ}6$ .

13th Oct.—Restless night; has had four pale and loose stools in last twenty-four hours; tongue dirty, dry in centre. Pulse, 120; temperature,  $105^{\circ}$ . Abdomen tumid. To have wet pack. Vesp.: pulse, 120; temperature,  $104^{\circ}6$ .

14th Oct.—Restless night, with noisy delirium up to 5 A.M.; slept for two hours after that; tongue dirty; has several rose spots on chest and abdomen; abdomen tumid. Pulse, 112, feeble; temperature,  $104^{\circ}2$ . To have 4 ounces port wine. Vesp.: pulse, 116; temperature,  $103^{\circ}$ . To have 15 grains of chloral with the same quantity of bromide of potass as a draught at bedtime. To be packed.

15th Oct.—Slept for three hours after draught; was quieted also by packing; has had four pale loose stools; tongue moist and dirty; abdomen tumid; rose spots; urine, sp. gr. 1020, albuminous, deficient in chlorides. Pulse, 120; temperature,  $102^{\circ}2$ . To have astringent mixture (chalk and catechu), and to be packed three times a day. Vesp.: temperature,  $103^{\circ}8$ ; after pack,  $103^{\circ}2$ . To have chloral and bromide draught.

16th Oct.—Slept well after draught; bowels moved twice; stools passed in bed. This morning patient is disturbed and restless, cries out when touched. Temperature in morning,  $103^{\circ}2$ ; in evening,  $104^{\circ}$ .

17th Oct.—Restless night, slept very little, was noisy and delirious. Five loose and dark stools in last twenty-four hours; passes both stools and water in bed; nothing on skin. Pulse, 120; temperature,  $103^{\circ}$ . To have 20 minims liq. ferri pernit. every four hours. Hair to be cut close and ice bag applied to head. Vesp.: pulse, 120; temperature,  $100^{\circ}6$ .

18th Oct.—Slept well without draught; two stools; no eruption. Pulse, 104; temperature,  $100^{\circ}6$ . Vesp.: temperature,  $101^{\circ}6$ .

19th Oct.—Slept well without draught; seems more himself, and recognised his mother for the first time; abdomen less tumid; bowels moved three times consciously. Pulse, 120, of better volume; temperature,  $103^{\circ}2$ . To have astringent mixture only three times a day. Vesp.: pulse, 124; temperature,  $103^{\circ}6$ .

20th Oct.—Slept well without draught; tongue cleaning. Pulse, 120; temperature,  $102^{\circ}6$ . Vesp.: pulse, 116; temperature,  $101^{\circ}2$ .

21st Oct.—Better altogether; has improved aspect; tongue cleaning. Temperature in morning,  $99^{\circ}$ ; in evening,  $98^{\circ}6$ .

22nd Oct.—Temperature in morning,  $98^{\circ}6$ ; in evening,  $99^{\circ}$ .

23rd Oct.—Temperature,  $98^{\circ}4$ .

Made steady and satisfactory convalescence.

CASE XI.—A. C., aged 10, brother of last case, began to ail on the 4th November, his first complaint being of pain in head. Was admitted late on 9th November.

10th Nov. (7th day of illness.)—Looks bright and well; tongue clean and moist; bowels loose—stools pale coloured; pulse, 108; temperature,  $103^{\circ}6$ . Vesp.: pulse, 112; temperature,  $104^{\circ}6$ .

11th Nov.—Slept fairly, but wandered much in his sleep; has had five loose stools in last twenty-four hours; abdomen slightly tumid; extremities and point of nose feel cold; temperature,  $104^{\circ}2$ ; evening,  $103^{\circ}6$ . To have 4 ounces of port wine.

12th Nov.—Bowels moved eight times in last twenty-four hours; abdomen tense and tumid; pulse, 120, feeble; temperature,  $103^{\circ}6$ ; no rash; to have 2 grains of acetate of lead every three hours. Vesp.: temperature,  $105^{\circ}$ .

13th Nov.—Restless night; three ochrey stools during night; has three petechial spots on abdomen, no other rash; temperature,  $103^{\circ}6$ ; vesp.,  $104^{\circ}6$ .

14th Nov. (11th of illness.)—Six loose stools; tongue dry: temperature,  $103^{\circ}4$ ; vesp.,  $105^{\circ}2$ .

15th Nov.—Restless night; seven loose stools, two passed in bed; pulse, 120; temperature,  $103^{\circ}2$ . Omit acetate of lead; to have ʒss. of tincture of catechu every three hours. Vesp.: bowels moved once since morning; patient has been very restless all day; eyes staring; add 5 min. tr. opii. to each dose of catechu.

16th Nov.—No stool since 9 P.M.; slept well till 5 A.M.; moans, and is delirious; has depressed and almost livid aspect; hands twitching, and lower lips quivering; petechial spots on abdomen continue, another has appeared on the buttock; tongue dry; sordes on teeth; pulse, 120; temperature,  $103^{\circ}2$ . Vesp.: temperature,  $104^{\circ}6$ .

17th Nov.—Slept for two hours; restless while awake; seven loose stools; temperature,  $103^{\circ}6$ ; vesp.,  $103^{\circ}2$ .

18th Nov.—Better night; three loose stools; asked for lemonade; temperature  $101^{\circ}6$ ; vesp.,  $102^{\circ}4$ .

19th Nov. (16th of illness.)—Good night; three stools; abdomen less tumid; temperature,  $102^{\circ}2$ ; vesp.,  $102^{\circ}6$ .

20th Nov.—Slept well; no stool for twenty-four hours; temperature,  $103^{\circ}4$ ; omit astringent; vesp., temperature,  $103^{\circ}6$ .

21st Nov.—One formed stool; temperature,  $102^{\circ}4$ ; vesp.,  $103^{\circ}2$ .

22nd Nov.—Got much worse during night; is pinched and sunken in aspect. Pulse, 176, scarcely perceptible; temperature,  $101^{\circ}2$ . To have a dessert-spoonful of brandy every quarter of an hour. Gradually sank and died at 3.50 P.M.

*Sectio* forty-four hours after death. Petechial spots gone; post-mortem lividity of back and legs.

*Chest* normal.



*Abdomen.*—Liver, spleen, and kidneys normal; intestinal glands agminated and solitary, quite healthy in appearance.

*Head.*—On opening into the cavity of the arachnoid there flowed away a largely increased quantity of fluid; here and there, chiefly along the course of the vessels, were seen deposits of lymph. The small vessels of the pia mater were injected and unusually distinct; this lymph effusion and the injection of the pia mater were noted only on the upper surface of the cerebrum, and more on the left than the right side. There was nothing abnormal at the base of the brain. The choroid plexus was normal, and only a slight increase of fluid in the ventricles. The cerebral substance was normal in appearance. There was a much greater than normal quantity of fluid in the spinal canal. In short, the only abnormalities were the increased quantity of cerebro-spinal fluid, the lymph effusion in the arachnoid, and the minute injection of the vessels of the pia mater.

These two cases illustrate the difficulties of diagnosis. During their whole course it was thought that they were both cases of typhoid; and not till the second proved fatal, and the true nature of the illness was demonstrated by post-mortem evidence, was it known that they were really cases of cerebro-spinal fever.

The rose spots noted in W. C.'s case wanted the lenticular outline of true typhoid spots, though no note was made of this fact till after the death of his brother.

CASE XII.—J. T., aged 21, a mechanic, came to hospital on 9th Dec. 1878. No satisfactory history could be got; but he seems to have been out of health for some weeks, complaining chiefly of general debility, accompanied by cough and swelling of the feet. Five days before admission he became suddenly worse; had rigors, headache, and increased debility, which compelled him to go to bed; on the following day he became delirious, and has been so more or less ever since.

*9th Dec.*—Vesp.: Patient moans incessantly, is barely sensible, and can give no account of self. Tongue dry; pulse, 102; temperature, 104°·6.

*10th Dec.*—Moaned nearly all night; tongue dry; pulse, 112; temperature, 102°; pupils equal and natural; slight bleeding from right ear; face covered with eruption of acne—this he always has. On trunk and arms is an eruption of isolated rose-red spots, not elevated, disappearing on pressure; urine drawn off by catheter, sp. gr. 1027, is deficient in chlorides, contains a considerable quantity of albumen, and deposits urates on standing. Evening temperature, 103°.

*11th Dec.*—Quiet night; slept a good deal; seems more sensible; tongue dry; pulse, 116, dichrotous; temperature, 101°·6; pupils natural; rash as yesterday; has some purulent discharge from

right ear; bowels moved naturally; still requires the catheter. Evening temperature,  $103^{\circ}2$ .

*12th Dec.*—Quiet night; very abundant rose rash over trunk and upper extremities; pulse, 120, dichrotous; temperature,  $99^{\circ}6$ ; still requires the catheter. Evening temperature,  $105^{\circ}6$ .

*13th Dec.*—Very restless night, moaning and screaming out at times; eyes suffused; pupils natural; urine passed in bed; rash as last noted; pulse very rapid and feeble; temperature,  $101^{\circ}$ ; patient much sunk, extremities cold. To have an ounce of whisky every hour. Vesp.: much sunk; temperature,  $102^{\circ}$ ; pulse cannot be counted.

*14th Dec.*—Sunk in bed; pulse barely perceptible; temperature,  $103^{\circ}2$ ; rash remains, but dingy in colour. He gradually sunk, and died at 9 P.M.

Post-mortem thirty-six hours after death.

*Chest.*—There were some old adhesions of left pleura; at the base of that lung there was an infarctus due to embolic plugging of a large vessel, the infarcted portion was wedge-shaped, the apex of the wedge pointing to the root of the lung, and involving the greater part of the lower lobe. A small infarctus was also found at the anterior part of the base of the right lung. The heart contained a firm pale clot in its right ventricle, entangled in the papillary muscles.

*Abdomen.*—Liver normal; spleen softer and rather larger than normal; kidneys darker than natural, but structurally sound. The ileum for 4 or 5 inches above the ileo-cæcal valve was congested, and had on its mucous surface several good-sized ulcers, which looked as if they had been punched out of the mucous surface; they were oval in shape, with their long diameter across the bowel; their edges were hard and not undermined. The ulcers were situate in the Peyers' patches, and were most marked in the last 2 inches of the ileum. The congestion of the bowel was not marked, and did not extend up for more than 4 to 5 inches; there was no appearance of sloughing, and the abdominal glands were not enlarged.

*Brain.*—There was a distinct increase in the quantity of cerebro-spinal fluid. The arachnoid covering the upper surface of the hemispheres, especially the left, was the seat of lymph deposit, most marked along the course of the veins, which were more than usually loaded. The base of the brain was quite healthy.

This is a very interesting case, the chief point of interest being the ulcerated condition of the ileum. During life he had the symptoms of cerebro-spinal fever with its characteristic rash well marked; and after death there was found the lesion of that disease. But in addition there was also found an ulcerated condition of that part of the bowel which suffers in typhoid fever; and a cursory examination might, on this evidence, have led to the conclusion that

the patient had died of typhoid. More careful examination of the intestinal ulcers showed that they owned a different origin. Typhoid ulcers have ragged undermined edges, and their long diameter is up and down. In this case the ulcers had hard, clearly defined edges, as if punched out of the bowel, and their long diameter was transverse. The man died of cerebro-spinal fever; but he happened also to have tubercular disease of the bowel, which not only accounted for his bad health before the onset of the fever, but handicapped him during it.

There are various points which call for more special notice than they receive in the mere report of the cases.

First as to DIAGNOSIS—

We see so little of this form of fever in this country, and so much of other forms for which it may readily be mistaken, that it is of some importance that we should know its essential features, and be able to diagnose it when it presents itself. The forms of fever for which it is most likely to be mistaken are typhus and typhoid fevers. To each of these, individual cases of cerebro-spinal fever may bear so close a resemblance that the differential diagnosis may be by no means easy. In sporadic cases, and in the earlier cases of an outbreak, errors in diagnosis may very readily be made; for the disease is rare, one is not on the outlook for it, and, unless its characteristic features are well marked, it may run its whole course without its true nature being recognised. I can recall the case of a private patient whom I attended in November 1876 for an attack of fever which proved fatal on the 15th day. The case presented all the features of typhus, but there was no rash. The case puzzled me somewhat, and as no post-mortem examination could be got, my doubts could not be cleared up. I certified the man as having died of typhus. I have no doubt now that it was cerebro-spinal fever.

Many of the cases whose details I have given were seen by competent and well-informed medical men before admission to hospital, but in not one instance was the true nature of the disease recognised. They were all sent in as cases of either typhus or typhoid fever by men who afterwards recognised their true nature. Even after admission to hospital, where they could be carefully watched, the diagnosis was often made with difficulty. The C. cases ran nearly their whole course before one was sure of the diagnosis. The first of the M. cases was so obscure that not till other members of the family suffered was its true nature known. In two cases (X. and XI.), occurring in two brothers, the disease so closely resembled typhoid fever in its symptoms and course that that was believed to be the malady from which they suffered, till the second had run its course to a fatal termination, and the true nature of the malady was declared by post-mortem examination. Then, and not till then, was it known that typhoid was not the disease from which they had suffered.



The main points of distinction, as they presented themselves in the cases related, were as follows:—

*The initial symptoms* are more marked in cerebro-spinal fever than in typhus or typhoid. In typhus they consist of shivering, headache, loss of appetite, thirst, and a general sense of misery.

In typhoid they are general malaise, loss of appetite, aching of limbs, and more or less headache. In cerebro-spinal fever we have the same symptoms, but, as a rule, the initial rigor is more marked, and the headache more intense. A common feature, too, is sickness. The intensity of the headache and the accompanying sickness were the characteristic initial symptoms in most of the cases. The headache, too, was more persistent, as well as more severe than in typhus or typhoid; in the former it generally passes off in a few days, and later on is replaced by delirium; in typhoid it may be more lasting, but is not so much complained of. In cerebro-spinal fever it is not only more intense, but lasts longer, possibly during the whole illness, and is not so apt to be replaced by delirium. The sickness is of cerebral origin, and is often very distressing during the first few days of the illness.

*The facial expression* in typical cases of cerebro-spinal fever is so peculiar that by it alone a diagnosis might almost be made. In typhus the expression is dull and heavy, and the eyes are injected. In typhoid it is listless and weary rather than heavy; there is often a circumscribed flush on the face, and the sclerotics are clear and pearly. In cerebro-spinal fever there is more intelligence of expression, and with it often a look of anxiety and distress which is almost characteristic. It is the expression not of pain, but rather of the apprehension of it. The patient is not anxious about himself, and no questioning gives evidence of any mental condition to account for it. He is in pain, and may be keenly alive to the fact that he is so; but the expression is more that of the dread and apprehension of pain than of its actual existence at the time. The cases in which this expression was most marked were those in which hyperæsthesia was also a marked symptom. So constant was this association that one could not but regard the anxiety and distress depicted on the countenance as the facial expression of that hypersensitive condition of the nerve centres which lay at the root of the hyperæsthesia.

*The Eruption.*—In typhus this consists of a mulberry rash coming out on the fourth and fifth day, not elevated, not disappearing on pressure, and persisting during the whole course of the fever, the intensity of the eruption being, as a rule, directly as the severity of the attack. So constant in its occurrence is the eruption in typhus, that its presence is regarded as almost essential to the establishment of the diagnosis. In typhoid the eruption consists of isolated rose-coloured spots, lenticular in shape, elevated, disappearing on pressure, coming out in successive crops, and appearing for the first time at the end of the first or beginning of

the second week. It is frequently absent. In the thirty-four cases of cerebro-spinal fever which constituted this outbreak, and of which twelve have been related, an eruption appeared in twenty-four, or 70 per cent. It consisted of spots of a rosy-red hue, of irregular outline, not elevated, disappearing on pressure. The spots varied in size from that of a pin head to that of a pea. Its general seat was the trunk and limbs; occasionally it was noted on the face and neck. There was no fixed time for its appearance; in one case it came out on the fifth day, in most it came out between the seventh and tenth days, but not unfrequently it was later in appearing. Neither had it any fixed duration; in a few cases it remained out only for one day, in others it came and went irregularly, but without disappearing; in cases in which it was more persistent, it generally disappeared some days before the commencement of defervescence; in a few, however, it remained out during the whole course of the illness, becoming darker in colour as the disease advanced, and towards the end of the illness bearing so close a resemblance to the typhus rash that it might, if seen only at that time, have been mistaken for it. In no case did it persist after death. There seemed to be no direct relation between the severity of the attack and the amount of eruption.

*Petechiæ* were noted in six of the thirty-four cases; in five the petechiæ co-existed with the rose rash, in one they formed the only eruption. These six cases were all severe; three of them proved fatal—two of them dying of the fever, and one of a sequela.

*Sudamina* were noted on the chest and abdomen in a few cases.

*Desquamation of the Skin.*—A notable feature in many of the cases was peeling of the cuticle, often as free as what one is in the habit of seeing in scarlatina. It was most marked in the early days of convalescence, but sometimes commenced before the febrile symptoms had disappeared. It was earliest and most abundant on the arms and legs as a rule, but affected the whole body more or less. It did not linger about the hands and feet, as is the case in scarlatina. It was most abundant in cases in which hyperæsthesia had been marked.

*Duration of the Febrile Symptoms.*—In twenty-two cases which recovered, and in which the date of commencement of illness was accurately ascertained, the average duration of the fever, calculating to the time at which the temperature became normal, was 16 days—the shortest 9, the longest 20 days. With the exception of the one case of 9 days, not one had a less duration than 14.

In no case did a distinct crisis occur; defervescence was always by lysis, the process of defervescence occupying at least two days; a distinct amelioration in the symptoms, and a progressive decline of temperature being noted for two or three days before the temperature reached the normal.

With reference to the two modes of defervescence noted in fevers, it may here be observed that in diseases such as typhus



and relapsing fevers in which there is no inflammatory local lesion, and nothing to delay defervescence after the fever has run its course, a distinct crisis—that is, a rapid defervescence—is common; while in maladies like typhoid and cerebro-spinal fevers, where a local inflammatory lesion is an essential and integral part of the disease, the temperature is kept up to a certain extent by this local lesion for a day or two after the fever has run its course; the fever may have run its course, and the poison cease to be reproduced; but the local inflammatory lesion cannot so abruptly decline—a few days are required for this. During these days the temperature is kept up a little by the remains of the local lesion, and defervescence is by lysis. On this view of the matter the mean duration of the fever in the twenty-two cases was thirteen to fourteen days.

*The range of temperature* presented no feature which could be regarded as distinctive or characteristic of the disease, and by means of which a diagnosis could be made between this and other forms of fever. The maximum height was generally reached by the end of the first week, and towards the end of the second it had begun to decline.

The highest temperature noted was  $105^{\circ}5$ , and that point was reached only once. In several cases it was above  $105^{\circ}$ ; but, as a rule, it ranged from  $102^{\circ}$  to  $104^{\circ}$ . The evening temperature, as in most fevers, was higher than the morning. Irregularity of range was an unfavourable indication here as in other fevers. In one or two cases a marked rise in the evening temperature was noted at the commencement of defervescence.

*Symptoms referable to the nervous system* occupied a prominent place, though not quite so prominent as one would be disposed to anticipate in a disease whose essential local lesion is inflammation of the cerebro-spinal membranes.

*Pain in the head* was one of the first symptoms. It was intense, and much more marked than in other forms of fever; it generally remained severe for the best part of a week, and then gradually diminished or passed away entirely.

*Pain in the spine*, with tenderness on pressure over different points, was frequently noted. This tenderness was more common over the cervical and lumbar vertebræ than over the dorsal.

*Hyperæsthesia* was present in a large proportion of the cases, the least touch making the patient wince, even the pressure of the bedclothes being irksome. With the cutaneous, there was also muscular hyperæsthesia, the slightest movement causing much pain. “I’m sore all over,” was the common response to the question as to the seat of pain. These were the cases in which the peculiar anxiety of expression already referred to was most marked. Cases in which cutaneous hyperæsthesia was pronounced were also those in which subsequent desquamation was most free.

*Tetanus*, in anything like a distinct form, occurred only in one

case, which proved fatal; but slight retraction of the neck was noted in several.

*Delirium*, when it occurred, was of the low muttering type, and was noted chiefly in cases in which death was threatened by asthenia. It was by no means a prominent symptom—not nearly so common as in typhus. It was most marked in patients who had passed middle life. Even in well-marked and pronounced attacks, the intellect was sometimes clear during the whole course of the disease. This may seem strange in a disease in which the cerebro-spinal centres are so materially involved; but it is to be noted, first, that the lesion of the nerve centres was, in all the fatal cases in which a post-mortem was obtained, limited to the membranes (in not one case was there evidence of disturbance of the cerebral substance); and, second, that this lesion was further limited to those portions of the nerve centres which are associated with the functions of organic life—the posterior cerebral lobes, the cerebellum, and the cord. The delirium seemed, in short, to be associated more with the general febrile state than with the local meningeal lesion. The peculiarities which that imparted to the illness seemed rather to be pain, sickness, hyperæsthesia.

*Deafness* was frequently noted, especially during the later stages, and during convalescence, but not more frequently than in typhus.

THE HEART presented no special peculiarity. Increased frequency of action there was, of course; and in cases in which death was threatened by asthenia there was the same enfeeblement of the systole that is noted in such circumstances in other forms of adynamic fever.

THE LUNGS.—With the exception of one case in which pleurisy occurred, there was no inflammatory complication. Occasionally a slight bronchitic wheeze was noted, and a short frequent cough was very common. Though there was no lung lesion, the character of the breathing was peculiar and almost distinctive in well-marked cases. The change in it was distinctly of cerebral origin. It was hurried, catchy, and irregular; but its chief peculiarity consisted in the mode in which the expiratory act was performed: inspiration was shallow, and expiration premature, hurried, and forcible, as if it were a voluntary effort. In cases in which this character of the breathing was most marked, the patient generally complained of want of breath. "I can't get breath," was the expression used. Yet there was no external appearance of defective aeration of the blood, and examination of the chest revealed no evidence of physical disturbance of heart or lungs. The inspiratory act was insufficiently performed—it stopped short of the point at which the air-cells are filled, and was succeeded, or rather interrupted, by an abrupt, hurried, and forcible expiratory effort. It was the expiratory act that was unduly hurried; and its premature onset it was that seemed to occasion the feeling of want of breath,

though probably the same disturbance of the respiratory centres that produced the change in the respiratory act aided in the production of this deranged sensation.

*Epistaxis* occurred in five of the thirty-four cases.

ABDOMINAL ORGANS.—*The Liver* gave rise to no symptoms during life, and in fatal cases showed nothing special beyond a slight increase of weight and a little darkening of colour.

*The Spleen* in fatal cases was always more or less enlarged, and was of softer than natural consistence. One case proved fatal by rupture of that organ.

*The Kidneys*.—Albuminuria was noted in seventeen of the thirty-four cases, exactly one-half. In none was there any blood in the water, and the albumen was not in large amount. In the later stages of the fever, and the early days of convalescence, there was frequently noted an excessive flow of urine, of pale colour, and of low specific gravity. It contained in such cases an increased amount of epithelial *débris*, and resembled the state of urine which is frequently noted in scarlatina.

*The Bowels* were generally constipated, though in several cases diarrhœa occurred. In all cases in which a post-mortem was made the intestinal glands were normal, except in the one man who was suffering from tubercular disease of the bowel before the fever attacked him.

CONTAGIOUSNESS.—Though various instances are recorded, especially by German physicians, in which the disease seems to have been communicated by the sick to the healthy, the general opinion is that the disease is not contagious. The facts recorded in this paper distinctly show that the disease may be so communicated, though they equally show that it is not so contagious as typhus. In the case of the C. family, for instance, the father was the first to suffer. He remained at home and was nursed by his wife. During his convalescence she and six out of seven children were prostrated by the disease.

Then there are the M.'s, D.'s, and K.'s. The first to take ill was the girl M., who resided in lodgings; then her mother, who was most with her, was seized; then the married sister, Mrs D., who helped the mother to look after her; then come the two other sisters; then Mrs D.'s two children; then came the case of Mr M., who had come from a distance to see his family. Then came the cases of the K.'s, who lived next door to the D.'s, and were in constant communication with them. First the little girl, the constant companion of the D. girls, suffered; then her little brother; then the father; and, finally, a sister of his, who resided in another part of the town, but visited her brother and his family during their illness.

In the O'N. family there were four successive cases, occurring one after the other, in which the evidence of the communication was so clear that the medical man who saw them at their home



thought that they were suffering from typhus, founding his diagnosis in part on the evident contagiousness of the disease with which he had to deal.

G. M. and his wife, in whose case the diagnosis was confirmed by post-mortem examination, contracted their illness from their daughter, who was treated at home for what was believed to be typhoid fever. They both took ill on the same day, three weeks from the commencement of their daughter's illness. She was nursed by them.

In the B. family the evidence of contagion was equally clear. H. was seized on the 2nd February, and came to hospital on the 10th; G. took ill on the 23rd, Mrs B. on the 24th, and C. on the 26th, the three last evidently contracting the disease from H. The nature of the illness was quite clear during life, and in Mrs B.'s case was verified by post-mortem examination.

Only one case originated in the hospital, that of C. D., and her attack was clearly due to contagion; for the four weeks immediately preceding her illness she had been the scrubber of the ward in which the female cases were treated; her duties led her to spend some considerable time every day in that ward.

Such is the evidence—ample, it seems to me—to prove that the disease was communicated from the sick to the healthy. It did not tend to spread from house to house, and to become epidemic as typhus does; but it was communicated from individual to individual, and the risk of such communication seemed to be directly as the closeness and intimacy of the personal contact, and that is what constitutes contagion.

*The Period of Incubation.*—This is difficult to determine with accuracy in any disease—a single exposure being so rarely followed by consequences. All that we can do in the present case is to determine in a few instances the limits within which exposure took place:—

1. A. M., so many members of whose family suffered, had been working in a different part of the country, and had not been home for three or four months. He came home on hearing of their illness. He came on the 31st December and left again on the 9th of January. He was seized on the 19th, and there can be no doubt suffered from the same form of fever as his family. Granting this, the period of incubation in his case was not less than ten days, nor more than nineteen.

2. The boy J. K. died in hospital of cerebro-spinal fever early on the morning of the 1st of February. His father, J. K., visited him frequently during his illness, and sat up with him the whole of the night on which he died. He was seized on the 11th February. Granting that he contracted the disease from his son, which is as certain as such a thing can be, the period of incubation was not less than ten days. Its other limit cannot be determined, as he had been more or less exposed to the disease for weeks.

3. J. K. came to hospital on the 18th February. Between the date of his seizure, Feb. 11th, and that of his removal to hospital, he was frequently visited by his sister, who resided in a different part of the town. She shivered on the 23rd, and as she did not see him after the 18th, the period of incubation in her case was not less than five days; its other limit cannot be determined, as she visited her brother's house during the illness of his children as well as during his own.

4. G. M. and his wife were both seized on the 3rd February. They both contracted the disease from their daughter, who took ill on the 10th January. The longest possible duration of their period of incubation was twenty-four days.

5. The B. family all lived in one room. Harriet, the first to suffer, took ill on the 2nd February, and was removed to hospital on the 10th. Her brother's illness commenced on the 23rd, her mother's on the 24th, and her sister's on the 26th February. Granting that they caught the disease from Harriet during the week that she was at home, of which there can be no reasonable doubt, the period of incubation in these cases was at least thirteen, fourteen, and sixteen days respectively, and in no case more than a week more. From the facts given one may reasonably draw the inference that the period of incubation in cerebro-spinal fever is about a fortnight.

**MORBID ANATOMY.**—The characteristic lesion of cerebro-spinal fever is found in the membranes of the brain and cord. In all the cases in which a post-mortem examination was made, this lesion was quite distinct. The appearances were the same in all, and consisted—(1), in increase, sometimes very considerable, in the quantity of cerebro-spinal fluid; (2), in lymphic effusion on the surface of the arachnoid; and (3), injection of the minute vessels of the pia mater. These appearances were found both on the brain and cord. The inflammatory signs were confined to the surface. In not one case was there any effusion into the ventricles, or increased vascularity of the substance of the brain or cord. On the surface of the brain, too, the lesion had its limits. In marked contrast with what occurs in tubercular meningitis, the inflammation was confined to the upper surface of the cerebral and cerebellar lobes, not in one case was any lesion found at the base. In the cerebrum, too, it was the posterior lobes that chiefly suffered. Sometimes one hemisphere was more affected than another. In one case the inflammatory products were found only on the cerebrum; in another only on the cerebellum and cord. This cerebro-spinal lesion was the only inflammatory lesion which was constantly found. The only other change which invariably presented itself was an enlarged and softened condition of the spleen, the enlargement and softening being as marked as anything one finds in typhus or typhoid fevers.

One word as to the nature of the disease. The view that we take of



this must depend on the view that we take of the nature and mode of production of the cerebro-spinal lesion, and of its relation to the general symptoms. Is it a simple non-specific inflammation like an ordinary pleurisy or peritonitis, or is it a specific lesion dependent, like the bowel lesion of typhoid, for instance, on the action of a special poison circulating in the blood? In other words, is the disease simply a cerebro-spinal meningitis, in which all the symptoms are dependent on the inflammatory lesion? or is it a cerebro-spinal fever, of which the meningeal inflammation is only the characteristic local lesion? That many of the symptoms are such as would be explained by the former view there can be no doubt, but to say that, is simply another way of saying that inflammation of the cerebro-spinal membranes must give rise to the febrile symptoms common to all serious inflammations, *plus* other special symptoms consequent on the peculiar seat of the lesion—*et cela va sans dire*. Such a view unduly limits the range of our vision; it takes in only one part of the field of our inquiry, and leaves untouched some very important questions. It is not enough to explain the general febrile disturbance, and the occurrence of special symptoms referable to the nervous system (which is all that that view does); we have also to explain why the disease spreads from individual to individual, affecting one member of a family after another, and always those most in contact with the sick. We have further to give some explanation of the occurrence of a peculiar and characteristic rash; of the frequency with which albuminuria occurred; of the enlarged and softened condition of the spleen; of the tolerably fixed and definite duration of the febrile symptoms, and of the rapidity with which these declined. Regarding the disease as a simple meningitis, these phenomena are inexplicable, for no simple local non-specific inflammation could give rise to the coincident occurrence in so many cases of a characteristic rash, of albuminuria, and of splenic enlargement; and it is beyond the range of the remotest probability that so many cases of so rare a disease as a simple idiopathic meningitis should occur in one hospital within so short a period of time; and that, having occurred, they should all have so similar a course and duration. The distinct evidence of contagiousness seems to give the final coup to the view which would regard the disease as simply a local inflammation.

There remains the other view that the disease is a true specific fever, of which the cerebro-spinal inflammation is the local lesion, bearing to the general ailment the same relation that the sore throat does to scarlatina, or the bowel lesion of typhoid fever to the general symptoms and pathology of that disease. According to this view the disease results from the action of a specific poison, which enters the system from without. Such a view ranks the disease among the specific fevers. On this view of its pathology the whole of the phenomena which present



themselves for our consideration are readily explained. Its evident contagiousness, the occurrence of a characteristic eruption, the presence of albumen in the urine, and the fixed duration of the febrile symptoms, are explained in the same way as the existence of like phenomena in other specific fevers. To one point in connexion with this argument I would for a moment draw special attention—it is the fact that some degree of splenic enlargement was frequently noted during life, and that in all the cases in which a post-mortem examination was made the spleen was large, soft, and of a mahogany colour. In one or two cases the softness amounted almost to diffuence, and in one case this went so far that the organ actually gave way while the patient was lying quietly in bed, and she died of hæmorrhage from rupture of the spleen. This condition of the spleen is one which is associated with no form of simple local inflammation, but only with fevers caused by a specific poison entering the system from without. We are most familiar with it as it presents itself in typhus and typhoid fevers.

The fact that this condition of the spleen was invariably found after death brings the evidence of morbid anatomy to support the view, which best serves also to explain the clinical features of the disease, that it is a true specific fever dependent on a special poison entering the system from without. This poison, like those of the other specific fevers, I believe to be a minute organism which is propagated in the system in and at the expense of the tissues in which it grows. An organism which thus grows in and at the expense of another is a parasite. It is a distinctive peculiarity of parasites that each has its own special nidus, its own habitat, in which, and in which alone it is reproduced. This one is found in small intestine, that in large; this in kidney, that in liver; this in brain, that in muscle; this on skin, that on mucous membrane. Regarding contagia as parasites we accord to them similar properties, and should expect to find that each contagium had a preference for some special locality. Now, what imparts its distinctive features to each of the diseases produced by contagia is, as a rule, not so much any peculiarity of the general symptoms, as the existence of some local complication, generally inflammatory mischief in this or that organ or tissue. Finding the same local lesion constantly occurring in connexion with the propagation in the system of a particular contagium, and finding that a similar lesion is never produced by any other agency, we cannot fail to see a connexion between the specific properties of the contagium and the distinctive lesion of the disease to which it gives rise. The exact nature of the connexion I believe to be that the seat of the lesion is also the nidus of the parasite; and that the disturbance which constitutes the lesion is the result of the propagation in that nidus of the millions of minute organisms which are reproduced during an attack of any of the specific fevers. On this view the

cerebro-spinal meninges are the nidus of the poison of cerebro-spinal fever, the special habitat in which that poison finds the material necessary to its reproduction, and it is because they are so, that inflammation of these membranes forms the characteristic lesion of that disease.

Treatment was essentially symptomatic. To keep the patient quiet, to give liquid nourishment, and to procure sleep, were the indications. Ice to the head and spine, with frequent sponging, were found to be comforting and to diminish restlessness. In cases in which there was much distress one or two full doses of chloral, with or without bromide of potass, were at times of signal service.

*Mortality.*—Of the thirty-four cases, eight died of the fever—a mortality of over 23 per cent.—and one of erysipelas during convalescence.





